



Non-Ionizing Radiation

Introduction

Non-ionizing radiation is described as a series of energy waves composed of oscillating electric and magnetic fields traveling at the speed of light. Non-ionizing radiation includes the spectrum of ultraviolet (UV), visible light, infrared (IR), microwave (MW), radio frequency (RF), and extremely low frequency (ELF). Lasers commonly operate in the UV, visible, and IR frequencies. Non-ionizing radiation is found in a wide range of occupational settings and can pose a considerable health risk to potentially exposed workers if not properly controlled.



Extremely Low Frequency Radiation (ELF)

Extremely Low Frequency (ELF) radiation at 60 HZ is produced by power lines, electrical wiring, and electrical equipment. Common sources of intense exposure include ELF induction furnaces and high-voltage power lines.



Radiofrequency and Microwave Radiation

Microwave radiation (MW) is absorbed near the skin, while Radiofrequency (RF) radiation may be absorbed throughout the body. At high enough intensities both will damage tissue through heating. Sources of RF and MW radiation include radio emitters and cell phones.



Infrared Radiation (IR)

The skin and eyes absorb infrared radiation (IR) as heat. Workers normally notice excessive exposure through heat sensation and pain. Sources of IR radiation include furnaces, heat lamps, and IR lasers.



Visible Light Radiation

The different visible frequencies of the electromagnetic (EM) spectrum are "seen" by our eyes as different colors. Good lighting is conducive to increased production, and may help prevent incidents related to poor lighting conditions. Excessive visible radiation can damage the eyes and skin.



Ultraviolet Radiation (UV)

Ultraviolet radiation (UV) has a high photon energy range and is particularly hazardous because there are usually no immediate symptoms of excessive exposure. Sources of UV radiation include the sun, black lights, welding arcs, and UV lasers.



Laser Hazards

Lasers typically emit optical (UV, visible light, IR) radiations and are primarily an eye and skin hazard. Common lasers include CO₂ IR laser; helium - neon, neodymium YAG, and ruby visible lasers, and the Nitrogen UV laser.

Additional Information

Related Safety and Health Topics Pages

- [Laser/Electrosurgery Plume](#)

Training

- [Non-Ionizing Radiation Presentations](#). OSHA Slide Presentations.
 - [Non-Ionizing Radiation: Standards and Regulations](#) [10 MB PPT*, 141 slides]. (2002).
 - [Introduction to Radio Frequency Radiation](#) [4 MB PPT*, 147 slides]. (2003).
 - [OSHA Regulation for RF Radiation Exposures](#) [92 KB PPT*, 16 slides]. (1995).
 - [OSHA Requirements for Tower Construction Related to RF Radiation](#) [1 MB PPT*, 42 slides]. (1999).
 - [Suggested Update to RF Standards Related to Wireless Communications](#) [4 MB PPT*, 90 slides]. (2001).
 - [Update of RF Radiation Protection Standards](#) [420 KB PPT*, 29 slides]. (1999).
 - [Introduction to Laser Safety](#) [8 MB PPT*, 48 slides]. (2001).

Other Resources

- [Nonionizing Radiation](#). New Jersey Department of Environmental Protection (NJDEP), (2003). Provides links to information on different sources of non-ionizing radiation such as heat sealers, microwave towers, radio and TV broadcast antennas, and so forth.

Accessibility Assistance: Contact the OSHA Directorate of Technical Support and Emergency Management at (202) 693-2300 for assistance accessing PPT materials.

*These files are provided for downloading.



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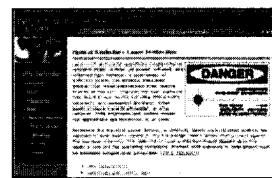
- [Additional Information](#)
- [Credits](#)

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Highlights

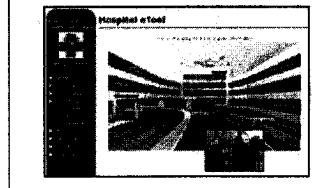
- [Eye and Face Protection](#). OSHA eTool. Provides a comprehensive hazard assessment, information about selecting protective devices for the workplace, as well as OSHA requirements.

- [Optical Radiation; Laser Protection](#). Discusses the types of personal protective equipment (PPE) that must be used to protect against laser hazards in the workplace.



- [Hospital](#). OSHA eTool. Focuses on some of the hazards and controls found in the hospital setting, and describes standard requirements as well as recommended safe work practices for healthcare workers.

- [Surgical Suite Module - Laser Hazards](#). Recommends solutions for laser hazards in the hospital setting.
- [Surgical Suite Module - Smoke Plume](#). Reports that an estimated 500,000 workers are exposed to laser or electro-surgical smoke each year, including surgeons, nurses, anesthesiologists, and surgical technologists.



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U.S. Department of Labor | Occupational Safety & Health Administration | 200 Constitution Ave., NW, Washington, DC 20210

Telephone: 800-321-OSHA (6742) | TTY: 877-889-5627

www.OSHA.gov